

Design Thinking for the Classroom

DRAFT

What is Design Thinking?

As a style of thinking, design thinking is generally considered the ability to provide creative solutions for problems by looking at the needs of the user (empathy), the generation of insights and rationality to analyze possible solutions to a specific context. While design thinking has become part of the popular lexicon in contemporary design and engineering practice, as well as business and management, its broader use in describing a particular style of creative thinking-in-action is having an increasing influence on twenty-first century education across disciplines.

While design thinking has its roots in the innovation/design sector, the process itself can be used anywhere. Indeed, it is a great tool for teaching 21st century skills, as participants must solve problems by finding and sorting through information, collaborating with others, and iterating their solutions based on real world, authentic experience and feedback.¹

Design thinking provides a path to greater creativity. By using the design thinking process students and teachers grow in their ability to be creative and to innovate on a regular basis. The process, if used, can transform difficult challenges into opportunities. Unfortunately, in many classrooms, we find there is an underlying expectation that students must strive for perfection, that they may not make mistakes, that they should always strive to be flawless. This kind of expectation makes it hard to take risks. It limits the possibilities to create more radical change. Design Thinking gives you permission to fail and to learn from your mistakes, because you come up with new ideas, get feedback on them, then iterate. It is always in progress. Students and educators need to experiment, and Design Thinking is all about learning by doing. In short, Design Thinking gives the confidence that new, better things are possible and that you can make them happen. And that kind of optimism is well needed in education.

Five phase of Design Thinking

- 1. Discovery**
- 2. Interpretation**
- 3. Ideation**
- 4. Prototyping (Experimentation)**
- 5. Refinement (Testing)**

¹ Ray, B (2012). Design Thinking: Lessons for the Classroom. Retrieved from <http://www.edutopia.org/blog/design-thinking-betty-ray>

SHOW DON'T TELL

Communicate your vision in an impactful and meaningful way by creating experiences, using illustrative visuals, and telling good stories.



FOCUS ON HUMAN VALUES

Empathy for the people you are designing for and feedback from these users is fundamental to good design.



EMBRACE EXPERIMENTATION

Prototyping is not simply a way to validate your idea; it is an integral part of your innovation process. We build to think and learn.



BE MINDFUL OF PROCESS

Know where you are in the design process, what methods to use in that stage, and what your goals are.



BIAS TOWARD ACTION

Design thinking is a misnomer; it is more about doing than thinking. Bias toward doing and making over thinking and meeting.



RADICAL COLLABORATION

Bring together innovators with varied backgrounds and viewpoints. Enable breakthrough insights and solutions to emerge from the diversity.

D.MINDSETS

The Design Process


The design process is what puts Design Thinking into action. It's a structured approach to generating and evolving ideas. It has five phases that help navigate the development from identifying a design challenge to finding and building a solution.

It's a deeply human approach that develops your ability to be intuitive, to interpret what you discover and to generate innovative ideas that are meaningful to those you are designing for—all skills our students will need in college and careers.



 DISCOVERY



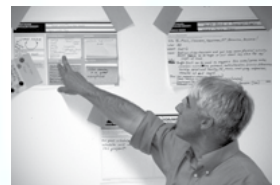
 INTERPRETATION



 IDEATION



 PROTOTYPING



 REFINEMENT

Methods are the core piece of this approach: they offer the actual instructions that help you put Design Thinking into action.

There are many, in order to provide you with a rich variety to choose from: every challenge requires a different approach and a different set of methods.

It often makes a lot of sense to follow these steps in a linear way, especially when you're starting out. But don't feel restricted by that: only you know how to best use this process. Use it along with other methodologies and theories you find useful to develop ideas. Adapt it, annotate it, cut it up, reconstruct it and make it your own.

Design Process

PHASES

1

DISCOVERY



I have a challenge.
How do I approach it?

2

INTERPRETATION



I learned something.
How do I interpret it?

3

IDEATION



I see an opportunity.
What do I create?

4

PROTOTYPING



I have an idea.
How do I build it?

5

REFINEMENT



I tried something new.
How do I evolve

STEPS

1-1 Understand
the Challenge

1-2 Research

1-3 Gather Inspiration

2-1 Capture your Learning

2-2 Search for Meaning

2-3 Frame Opportunity

3-1 Generate Ideas

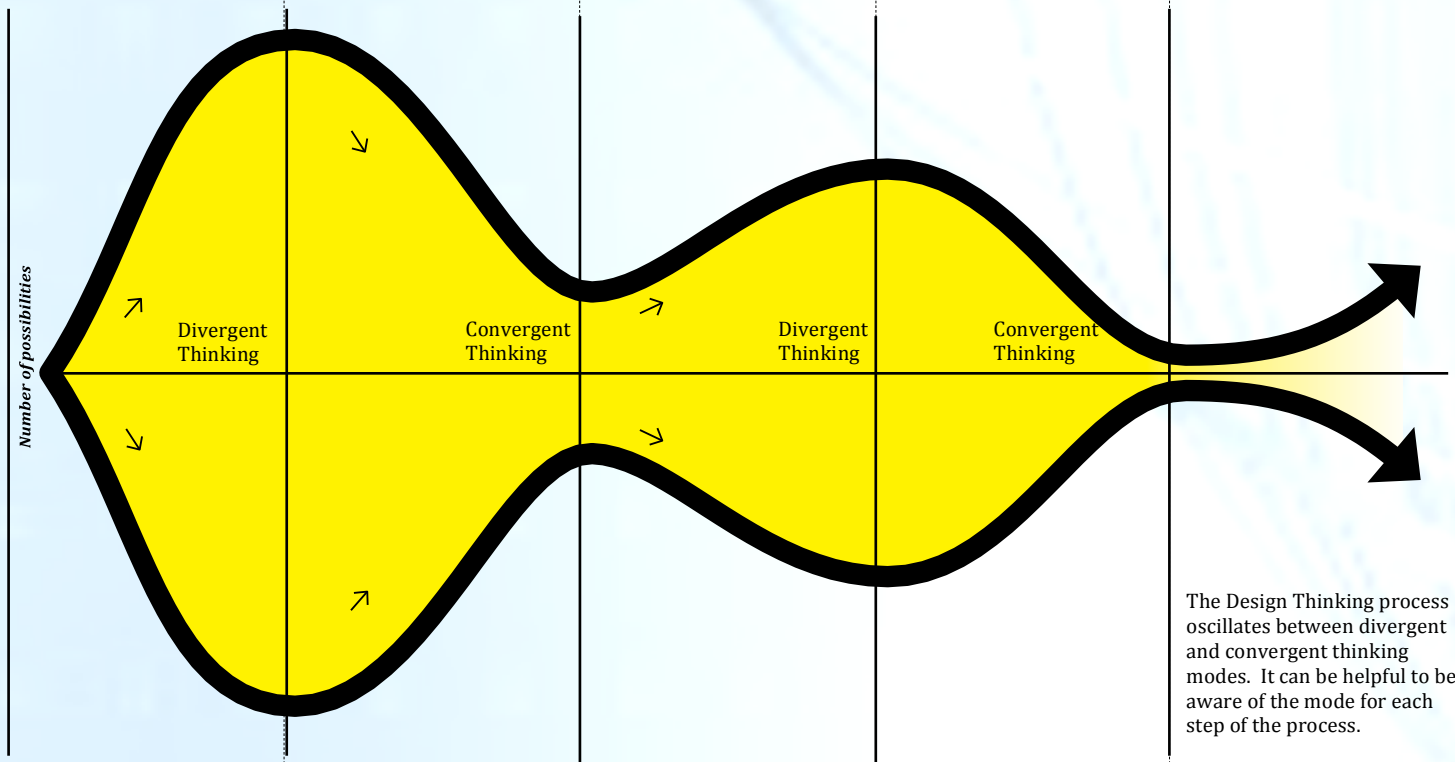
3-2 Refine Ideas

4-1 Build Prototypes

4-2 Get Feedback

5-1 Track Learning

5-2 Move Forward





Getting Started

WHAT'S IN THIS SECTION

Define a Challenge
Create a Project Plan

Define a Problem

Design Thinking is not just for a woodshop or art class. It can be used to teach anything from literature to mathematics. The Generative Topic is the key to great Design Thinking. You have a great opportunity to engage your students based on the words you use. If you are going to be in a position to inspire your students you need to feel inspired yourself. Most of our traditional topics can very quickly be given a new lease of life by developing a more generative topic title. We need to be able to literally propel our learners into the topic with these few words. The title is their first introduction to a design thinking project and so should immediately inspire them to be involved.²

You as teachers will be able to refresh existing content in short order and create an inquiry-focused title that really kicks things off well. These titles will help teachers to plan ahead what their design thinking work will look like, the places where it merges with other subjects and the curriculum coverage they can achieve.

Your Next Steps

- Find some colleagues to discuss your topics.
- Share a traditional topic title and curriculum goals - where do you normally start?
- Share ideas for new provocative titles.
- Record every single idea, one under the other on some large paper.
- Turn any questions into statements.
- Keep adding ideas until you hit upon a natural stop.
- Take a look on TED.com at the talk titles - search key terms related to your topic - TED talks have some great titles you can draw inspiration from.
- Share your ideas so far with someone else to get some perspective.
- Discuss which title ideas you like the most so far and why?

Checklist for Generative Topic Titles

Use the following questions to scrutinize your title ideas once you have a couple you like:

- Does it pass the "So what?" test?
- Is it epic and big scale, not tiny and 'fake'?
- Does it cover more than just one curriculum subject or topic?
- Does it spark your natural curiosity?
- Is there enough potential material in which learners can immerse themselves?
- Can it be made accessible, feasible to access for every learner?

Bonus question: When you share it with other people do they make that "Oooooo, mmmmm?" sound? (You'll know it when you hear it!)

Once you have the generative topic title, you can now generate the specific questions or problem to be given. An example:

Community for Unity: How can our community unite to benefit our school?

² Ford, P. Design Thinking: Immersion 1 Develop a Generative Topic Title. Retrieved from <http://notosh.com/lab>.

Create a Project Plan

Once you have decided on the challenge/problem that you would like to work on, you can start to plan your design project. The first task will be to find the right amount of time for the project. The beauty of Design Thinking is that you can do a project in a small block of time or over an extended amount of time. It only depends on the depth of the challenge and the product that you desire to receive at the end of the process.

Do it a day or a small block of time

DAY

8am

9:00-10:00

10:00-11:00

11:00-12:00

12:00-1:00

5pm

Immerse over a week

MON TUE WED THU FRI

8am

8:00-9:00

8:00-9:00

8:00-9:00

8:00-9:00

8:00-9:00

5pm

Whatever the length of time you choose, the process is the same. You will just get more in-depth thinking, collaboration and creativity with an extended time frame!

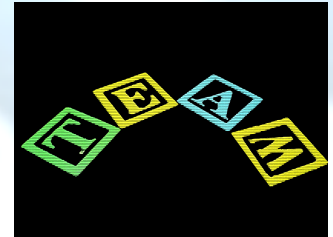
Prepare Before You Start

Before you begin, here are a few tips that will help you make the most out of the process.

Teams

The team is stronger than any individual- you know this well as a guiding principle of education. And collaboration is inherent to Design Thinking: having a team of students who offer different strengths and perspectives will enable the team to solve complex challenges. But team work isn't always easy. Team dynamics can be as limiting as they are empowering. Here's how to build a great team.

- Start small – groups of two or three are a good starting point
- Choose groups with differing ability and perspectives
- Assign roles – assign roles to each of the students so they are clear as to what is expected



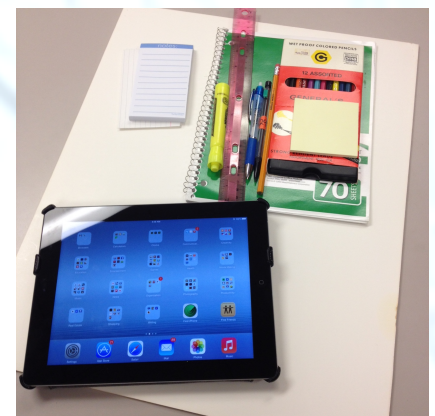
Spaces

A dedicated space, even if just a wall, gives the team a physical reminder of their work. It allows them to put up notes from their research and to be continuously immersed in their learning. Shared visual reminders help track the progress of the project and help students stay focused on the challenge. When doing a Design Thinking project over an extended period of time, it can be helpful to have team change spaces from time to time. The change in the space can help teams get unstuck when the work gets more challenging.



Materials

The Design Thinking process is visual, tactile and experimental. You often create an overview that's visible for everyone on the team or come up with a quick sketch to explain your idea. Make sure that you have supplies on hand that make it easy to work in that fashion. Most of the stages will require some type of technology, post-it notes or pad of paper or a flipchart and markers. The more materials that you can supply, the more diverse the product that students will create. Remember, the teams may prototype in several ways including: sketch, model, role-play, diagram, mock-up, storyboard, presentation, create an ad, or other multimedia product.





The Design Thinking Process

WHAT'S IN THIS SECTION

*Design Thinking Phases
Methods*

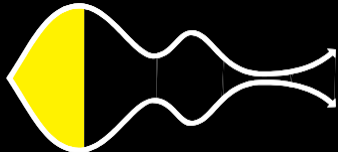
Phase

1

Discovery



WHERE YOU ARE IN THE PROCESS



WHAT'S IN THIS PHASE

- 1-1 *Understand the Challenge*
- 1-2 *Research the Problem*
- 1-3 *Gather Inspiration*

**Standards**Common Core

RS1, RS10, SL1, AV6

NETS-S

N2, N4

Phase 1: Discovery

Discovery builds a solid foundation for your ideas. Creating a meaningful understanding gives you the opportunity for insights not otherwise discovered. Discovery means opening up to new opportunities and getting inspired to create new ideas. With the right preparation, this can be eye opening and will give you a good understanding of your design thinking challenge.

1-1 Understand the problem

In this first step of Design Thinking, the students will go through the process of understanding the problem.

Review the problem:

What do I know? Here the students write their thoughts about the problem, listing everything they believe they know about the problem. The students will interview the other student to get this information. This helps the students stay on task and not slip into conversation.

What do I want to know? After the students conduct their interviews and list all that they know, they may want to list things that they discovered they want to know.

1-2 Research the problem

At this point students will research the topic to go beyond what they already know. They can do their research in a variety of ways. They may want to research on the Internet, from a book, interview an expert, visit an outside location or make observations. (Note: Their research could include curriculum coverage, direct teaching, or a class activity). The idea is to gather as much information about the challenge as possible. Use the Design Thinking Planning Guide to get ideas.

1-3 Gather Inspiration

By immersing themselves in the challenge, students will start to see the important attributes and hopefully develop focus that inspires them.

METHOD

Assume a Beginner's Mindset



WHY assume a beginner's mindset

We all carry our experiences, understanding, and expertise with us. These aspects of yourself are incredibly valuable assets to bring to the design challenge - but at the right time, and with intentionality. Your assumptions may be misconceptions and stereotypes, and can restrict the amount of real empathy you can build. Assume a beginner's mindset in order to put aside these biases, so that you can approach a design challenge afresh.

HOW to assume a beginner's mindset

Don't judge. Just observe and engage users without the influence of value judgments upon their actions, circumstances, decisions, or "issues."

Question everything. Question even (and especially) the things you think you already understand. Ask questions to learn about how the user perceives the world. Think about how a 4-year-old asks "Why?" about everything. Follow up an answer to one "why" with a second "why."

Be truly curious. Strive to assume a posture of wonder and curiosity, especially in circumstances that seem either familiar or uncomfortable.

Find patterns. Look for interesting threads and themes that emerge during your discovery.

Listen. Really. Lose your agenda and let the scene soak into your psyche. Absorb what people say to you, and how they say it, without thinking about the next thing you're going to say.

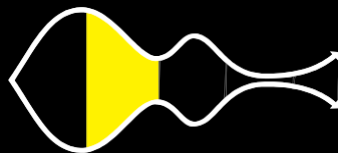
Phase

2

Interpretation



WHERE YOU ARE IN THE PROCESS



WHAT'S IN THIS PHASE

- 2-1 *Capture your Learning*
- 2-2 *Search for Meaning*
- 2-3 *Frame Opportunities*



Lino

Sticky
Notes

iCardSort

Simple
MindPopplet
Lite

MindNode



Maptini



IdeaSketch

Standards

Common Core

RS1, WS1, SL1

NETS-S

N1, N2, N4

Phase 2: Interpretation

This is the most difficult phase of the design thinking process. Interpretation transforms your discovery of the challenge into meaningful insights. Research, interviews, conversations can be great inspiration, but finding meaning and turning it into actionable opportunities is not an easy task. It involves unpacking and synthesizing your findings from the discovery phase to reach a compelling point of view and clear direction for ideation. Understanding the challenge and the insights that you can leverage is fundamental to a successful and innovative solution.

2-1 Capture Your Learning

“Story share-and-capture” helps unpack all the learning that took place in the discovery phase. Each team member airs out his or her story and notes based on the work that was done. Even if the team did all of the work together, they still need to tell their story. Each member in the group records headlines, surprises, and other interesting tidbits – one headline per post-it.

2-2 Search for Meaning

The post-its created in 2-1 are then used to find patterns and meaning. The team will physically group the post-its to find themes or patterns. The team will post all post-its on a large space. The team then begins to sort the post-its by related parts. There is a good chance that the team will already have noticed patterns or relations while creating the post-its. The goal is to sort all of the post-its to discover patterns and interesting findings to create meaningful insights, which will be useful in your ideation.

2-3 Frame Opportunities

Now that the team has sorted all of the post-it notes, it's time to synthesize that information into an actionable problem statement that will guide the ideation process. You might have the team select items that surprised them, connect the patterns back to the original challenge, or pick another team to share their thoughts about the patterns that emerged. There are many methods to accomplish this process, but the idea is to create the team's point-of-view for the challenge. Some methods:

- Write a “How might we..?” question
- Use a POV mad-lib
- Write an anthology

At the end of this phase, each team should have an actionable problem statement that reframes the challenge and provides a focus for the ideation phase.

METHOD

Story Share-and-Capture



WHY story share-and-capture

A team share serves at least three purposes. First, it allows team members to come up to speed about what different people learned in the discovery phase. Even if all the team members were present for the same discovery work, comparing how each experienced it is valuable. Second, in listening and probing for more information, team members can draw out more nuance and meaning from the experience than you may have initially realized. This starts the synthesis process. Third, in capturing each interesting detail of the discovery work, you begin the space saturation process.

HOW to story share-and-capture

Unpack observations and air all the stories that stick out to you about what you saw and heard during your discovery work. Each member in the group should tell user stories and share notes while other members headline quotes, surprises, and other interesting bits - one headline per post-it. These post-its become part of the team's space saturation, and can also be physically grouped to illuminate theme and patterns that emerge (See "Saturate and Group" method card). The end goal is to understand what is really going on with the challenge and create an actionable problem statement that reframes the problem and guides the ideation process.

METHOD

Saturate and Group



WHY saturate and group

You space saturate to help you unpack thoughts and experiences into tangible and visual pieces of information that you surround yourself with to inform and inspire the design team. You group these findings to explore what themes and patterns emerge, and strive to move toward identifying meaningful needs and insights that will inform your design solutions.

HOW to saturate and group

Saturate your wall space (or work boards) with post-its headlining interesting findings (see "Story Share-and-Capture") plus pictures from the field of users you met and relevant products and situations.

In order to begin to synthesize the information, organize the post-its and pictures into groups of related parts. You likely have some ideas of the patterns within the data from the unpacking you did when producing the notes. For example, you may have seen and heard many things related to feeling safe, and many things regarding desire for efficiency. Within the group of 'safety', go beyond the theme and try to see if there is a deeper connection that may lead to an insight such as "Feeling safe is more about who I am with than where I am". Maybe there is a relation between groups that you realize as you place items in groups - that safety is often at odds with users' desire for efficiency. Try one set of grouping, discuss (and write down) the findings, and then create a new set of groups.

The end goal is to synthesize data into interesting findings and create insights which will be useful to you in creating design solutions.

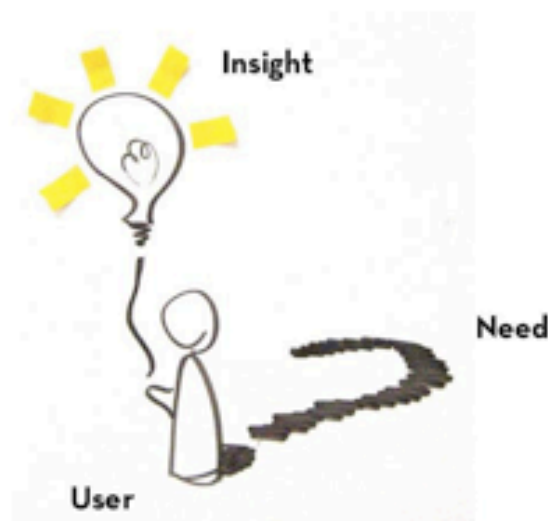
It is common to do the grouping with post-its headlining interesting stories from discovery work. But grouping is also useful to think about similarities among a group of products, objects, or users.

How MIGHT WE...?

d.

METHOD

Point-of-View Madlib



WHY use a POV madlib

A point-of-view (POV) is your reframing of a design challenge into an actionable problem statement that will launch you into generative ideation. A POV Madlib provides a scaffolding to develop your POV. A good POV will allow you to ideate in a directed manner, by creating How-Might-We (HMW) questions based on your POV (see "Facilitating Brainstorms"). Most of all, your POV captures your design vision - your responsibility and opportunity as a designer is to discover and articulate the meaningful challenge.

HOW to use a POV madlib

Use the following madlib to capture and harmonize three elements of a POV: user, need, and insight.

[USER] needs to [USER'S NEED] because [SURPRISING INSIGHT]

Use a whiteboard or scratch paper to try out a number of options, playing with each variable and the combinations of them. The need and insight should flow from your unpacking and synthesis work. Remember, 'needs' should be verbs, and the insight typically should not simply be a reason for the need, but rather a synthesized statement that you can leverage in designing a solution. Keep it sexy (it should intrigue people) and hold the tension in your POV.

For example, instead of "A teenage girl needs more nutritious food because vitamins are vital to good health" try "A teenage girl with a bleak outlook needs to feel more socially accepted when eating healthy food, because in her hood a social risk is more dangerous than a health risk." Note how the latter is an actionable, and potentially generative, problem statement, while the former is little more than a statement of fact, which spurs little excitement or direction to develop solutions.

METHOD

POINT-OF-VIEW ANALOGY

You don't want to miss this!

30-40 Thousand
LPs @ \$1.00 each!

Doubles \$2.00

Triples & Box
Sets \$3.00

Rock,
Soul, Jazz,
Blues, Folk,
Classical,
International,
Original Cast
& Soundtrax,
Country, Lounge,
Childrens, etc.



ALSO, 1,000s of
CDs, DVDs & Books
...VHS & Cassettes!

No Parking in
Record Man
Lot. There is
plenty of
parking
across the
street on
Diller &
Franklin and
around the
corner.

Sale starts
at 8:00am.

All Credit
& Debit
cards are
accepted.






**CHECK
OUT OUR
NEW \$5
RECORD
STORE IN
PLANET
MIX!**

WHY use a POV analogy

A point-of-view (POV) is your reframing of a design challenge into an actionable problem statement that will launch you into generative ideation. A POV Analogy can be a concise and compelling way to capture how you define the design challenge (your POV!). A good analogy will yield a strong directive of how you go about designing the final solution.

HOW to use a POV analogy

Use concise analogies to distill ideas. Metaphors and similes can encapsulate your insights in a rich picture. Discover metaphors from the work you do in synthesizing information, and looking at analogies between your user's situation and other areas.

For example, one metaphor from industry is:

"Personal music player as jewelry,"

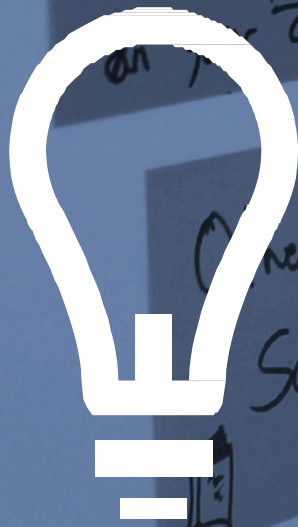
which provides the directive for creating the iPod. Looking at the headset as jewelry, rather than simply speakers, allows the designer to create a product that users will enjoy as a projection of themselves, rather than merely a utilitarian device. You can imagine this could have been seeded by an insight about how a user views her music collection - that "her identity is linked to the bands she listens to, and her relationships are bolstered by shared music taste."

A metaphor can also be embedded into a more comprehensive POV.

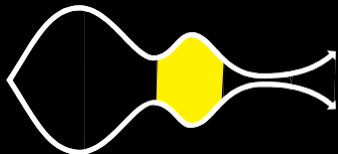
For example you may create the following POV:

"A works-hard-plays-hard young professional needs to be motivated at work with a job that is more like a first-person-shooter than Tetris."

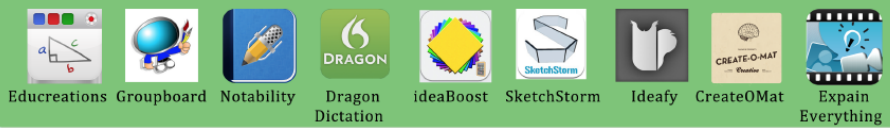
Phase 3 *Ideation*



WHAT'S IN THIS PHASE



- 3-1 Generate Ideas
- 3-2 Refine Ideas



Phase 3: Ideation

Ideation means generation lots of ideas. Brainstorming encourages you to think expansively and without constraint. It's often the wild ideas that spark visionary thoughts. With careful preparation and a clear focus, a brain storming session can yield hundreds of fresh ideas!

3-1 Generate ideas

In this phase of Design Thinking, the students will go through the process of generating ideas. You can facilitate the brainstorming process by doing a pre-brainstorming activity. These activities can really get the ideas flowing from all team members.

At the start of the brainstorming session, be sure to go over the rules with each team. Explain each rule and its purpose. This helps ensure a more productive brainstorming session. Be sure that you equip each team with the necessary supplies for the brainstorming session. They will need post-it notes, pens or pencils, any technology that is available and a brainstorming space.

100 idea challenge³

The 100-idea challenge is a great way to motivate teams to go for quantity and diversity in their brainstorming session. Here is how it works:

- Teacher facilitates and keeps time
- Insist that everyone stands up
- Explain the rules
 - Write everything down
 - You only have 10 minutes
 - Do not discuss ideas, just get them recorded
- Offer prize for most ideas in the time
- Encourage group to work quietly for a couple of minutes to generate 10 ideas to start
- Give time updates and countdown to finish
- Celebrate the winners and everyone's effort

3-2 Refine ideas

At this point each team will have dozens of new ideas to sift through. Before the final selection process begins team members may want to pitch their ideas to the other members. Then the teams will select the ideas that they will carry through to the prototyping phase. There are many methods to narrow their selections. Here are a few:

- Post-it note voting
- Score out of 10 for NEW/USEFUL/FEASIBLE (can use a any scoring system)
- Best ideas, Worst ideas – this method mashes two ideas into one.
- Sane idea, Crazy idea – mashes two ideas into one
- Categorize – choose one idea from each of four categories
 - Physical prototype
 - Digital prototype
 - Experience prototype (role-playing, skit, etc)

With a few ideas in hand, the teams move on the next phase.

³ Ford, P. (March 2013). *Design Thinking: Ideation 1 – Come Up with (a lot of) Great Ideas*. Retrieved from notosh.com

Brainstorming Rules

These seven rules will make your brainstorming session focused, effective and fun. Introduce them at the start of every brainstorm, even if they merely serve as a reminder for experience participants.

Defer judgment. There are no bad ideas at this point. There will be plenty of time to narrow them down later.

Encourage wild ideas. Even if an idea doesn't seem realistic, it may spark a great idea for someone else.

Build on the ideas of others. Think "and" rather than "but."

Stay focused on topic. To get more out of your session, keep your brainstorm question in sight.

One conversation at a time. All ideas need to be heard, so that they may be built upon.

Be visual. Draw your ideas, as opposed to just writing them down. Stick figures and simple sketches can say more than many words.

Go for quantity. Set an outrageous goal—then surpass it. The best way to find one good idea is to come up with lots of ideas.

METHOD

Stoke



WHY stoke

Stoke activities help teams loosen up and become mentally and physically active. Use stoke activities when energy is wavering, to wake up in the morning, to launch a meeting, or before a brainstorm.

HOW to stoke

Do an activity that gets your creativity going and increases your team members' engagement with each other. A good stoke activity not only increases energy but also requires each person to actively engage, listen, think, and do. For example, when playing Pictionary you must watch a teammate drawing, listen to other teammates guessing the answer (allowing you to build on those ideas), think of what the answer might be, and call out guesses yourself. Keep the activity brief (5-10 minutes) and active so you can jump into your design work after. Many improv games are good stoke activities. Try one of these:

Category, category, die! Line folks up. Name a category (breakfast cereals, vegetables, animals, car manufacturers). Point at each person in rapid succession, skipping around the group. The player has to name something in the category. If she does not, everyone yells "die!!" and that player is out for the round.

Sound ball. Stand in a circle and throw an imaginary ball to each other. Make eye contact with the person you are throwing to, and make a noise as you throw it. The catcher should repeat the noise while catching, and then make a new noise as he throws to next person. Try to increase the speed the ball travels around the circle. Add a second ball to the circle to increase each person's awareness.

"Yes, Let's" Everyone walk around the room randomly, and then one person can make an offer: "Let's act like we're all at a birthday party," "Let's be baby birds," or "Let's act like we don't understand gravity." Then everyone should shout in unison the response, "Yes, let's" and proceed to take the directive by acting it out. At anytime someone else can yell out the next offer. The answer is always, "Yes, let's!"

METHOD

Facilitate a Brainstorm



WHY facilitate a brainstorm

Good facilitation is key to a generative brainstorm. You brainstorm to come up with many, wide-ranging ideas; a good facilitator sets the stage for the team to be successful doing this.

HOW to facilitate brainstorm

ENERGY - As the facilitator it is your task to keep the ideas flowing. Perhaps the most important aspect of a successful brainstorm is the seed question that you are brainstorming about (see the "How Might We" method card for more information). During the brainstorm keep a pulse on the energy of the group. If the group is slowing down or getting stuck, make an adjustment. Create a variation to the "How-might-we?" (HMW) statement to get the group thinking in another direction (prepare some HMW options ahead of time). Or have a few provocative ideas in your back pocket that you can lob in to re-energize the team.

CONSTRAINTS - Add constraints that may spark new ideas. "What if it had to be round?" "How would superman do it?" "How would your pet design it?" "How would you design it with the technology of 100 years ago?" Additionally you can create process constraints. Try putting a time limit on each how- might- we statement; shoot for 50 ideas in 20 minutes.

SPACE - Be mindful about the space in which you conduct a brainstorm. Make sure that there is plenty of vertical writing area. This allows the group to generate a large number of potential solutions. Strike a balance between having a footprint that is big enough for everyone, but also is not so large that some people start to feel removed. A good rule of thumb is that all members of the group should be able to reach the board in two steps. Also, make sure each person has access to sticky notes and a marker so they can capture their own thoughts and add them to the board if the scribe cannot keep up with the pace. (See more about scribing on the "Brainstorming" method card.)

METHOD

Selection



WHY brainstorm selection is important

Your brainstorm should generate many, wide-ranging ideas. Now harvest that brainstorm, so those ideas don't just sit there on the board. Harvesting is straight forward for some brainstorms (pick a couple of ideas), but when ideating design solutions give some thought to how you select ideas. Carry forward a range of those ideas, so you preserve the breadth of solutions and don't settle only for the safe choice.

HOW to select

In the selection process, don't narrow too fast. Don't immediately worry about feasibility. Hang on to the ideas about which the group is excited, amused, or intrigued. An idea that is not plausible may still have an aspect within it that is very useful and meaningful.

Different selection techniques can be used, including these three:

1. Post-it voting - each team member gets three votes and marks three ideas that he or she is attracted to. Independent voting allows all team members to have a voice.
2. The four categories method - the method encourages you to hang onto those crazy but meaningful ideas. Elect one or two ideas for each of these four categories: the rational choice, the most likely to delight, the darling, and the longshot.
3. Bingo selection method - like the four categories method, this is designed to help preserve innovation potential. Choose ideas that inspire you to build in different form factors: a physical prototype, a digital prototype, and an experience prototype.

Carry forward multiple ideas into prototyping. If an idea is so far out there that it seems pointless to test, ask yourselves what about that solution was attractive, and then test that aspect or integrate it into a new solution.

Phase

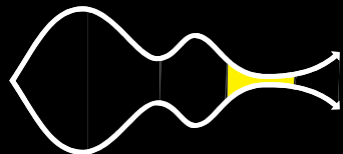
Phase

4

Prototyping



WHERE YOU ARE IN THE PROCESS



WHAT'S IN THIS PHASE

- 4-1 *Make Prototypes*
- 4-2 *Get Feedback*



Standards
Common Core
WS1, SL1
NETS-S
N1, N2, N4

Phase 4: Prototyping/Experimentation 2

Prototyping is getting your ideas out of your head and into the physical world. A prototype can be anything that takes physical form – be it a wall of post-it notes, a role-playing activity, an object, a digital interface, a presentation, or even a storyboard. Experimentation means making ideas tangible, learning while building them and sharing them with other people. Early prototypes should be rough and rapid to allow the team to receive direct feedback and learn how to further improve and refine an idea.

4-1 Build Prototypes

Time to build. Teams should start building their prototypes without worrying about getting it right the first time. Prototypes will change significantly over time. Teams can build using a sketch, a storyboard, a model, diagram, a wall of post-notes, a mock-up, a presentation, a movie, an ad or whatever seems appropriate for their idea. Team should build their prototypes with the user in mind, trying to let the user “experience” their idea. Teams should look for feedback by sharing their prototypes.

4-2 Get Feedback

Once the teams have finished their first prototypes, they will need to collect feedback to help them improve their design. There are several ways that teams can receive feedback from their peers. They can pitch their prototypes to the group and solicit feedback or they can get feedback in a more formal way. However they get their feedback, they will be taking those ideas and suggestions back to integrate into their next prototype iteration.

Once teams have the feedback from their peers, they will need space and time to discuss the feedback they received. It is important that teams get to have these conversations while the feedback is fresh in their minds. Teams will discuss the feedback and decide what and how to incorporate them into their designs. Teams might want to consider:

- What did participants value the most?
- What got them excited?
- What convinced them about the idea?
- What parts did they want to change?
- What did not work?
- What needs further investigation?

Once teams know how to improve their prototype, they incorporate those ideas. Most concepts cannot be fully realized in just one prototype. Teams might make two or three before they feel it encapsulates their ideas.

METHOD

Impose Constraints



WHY impose constraints

It is a bit counterintuitive, but imposing constraints with intention can actually increase your creative potential. Try it: Think of as many white things as you can in ten seconds. Now think of white things in your kitchen. Did the more constrained prompt spark more ideas?

HOW to impose constraints

There are many times throughout the design process when imposing constraints can help you be a more successful designer. However, being conscious of what filters you place on your design process, and when, is very important. Imposing a specific constraint on your idea generation is different than rejecting ideas because of pre-conceived notions of what you are trying to make.

Three areas where imposing constraints can be useful are in ideation, in prototyping, and with time:

IDEATION: During a brainstorm, or when you are ideating with a mindmap, temporarily add a constraint. This constraint might be "What if it were made for the morning?" or "How would McDonald's do it?". Keep this filter on the ideation for as long as it is useful. (For more, see the "Facilitate a Brainstorm" card.)

PROTOTYPING: In prototyping, particularly in early stages, you build to think. That is, you reverse the typical direction - of thinking of an idea and then building it - to using building as a tool to ideate. You can increase the output of this process by imposing constraints. Constrain your materials to push toward faster, lower resolution prototypes and increase the role of your imagination. Developing a checkout service? Prototype it with cardboard, Post-its and a Sharpie. Making a mobility device? Do it with cardboard, Post-its and a Sharpie. Designing an arcade game? Cardboard, Post-its, Sharpie. Additionally, as with brainstorming, put constraints on the solution itself.

How might you design it . . . for the the blind? Without using plastic? Within the space of an elevator?

TIME: Create artificial deadlines to force a bias toward action. Make two prototypes in an hour. Brainstorm intensely for 20 minutes. Spend three hours with users by the end of the weekend. Develop a draft of your point-of-view by the end of the hour.

METHOD

Prototype to Test



WHY prototype to test

Prototyping to test is the iterative generation of low-resolution artifacts that probe different aspects of your design solution or design space. The fundamental way we test our prototypes is by letting users experience them and react to them. In creating prototypes to test with users you have the opportunity to examine your solution decisions as well as your perception of your users and their needs.

HOW to prototype to test

Think about what you are trying to learn with your prototypes, and create low-resolution objects and scenarios which probe those questions. Staying low-res allows you to pursue many different ideas you generated without committing to a direction too early on. The objective is not simply to create a mock-up or scale model of your solution concept; it is to create experiences to which users can react. Bring resolution to the aspects that are important for what you are trying to test, and save your efforts on other aspects. You also need to think about the context and testing scenario you will create to get meaningful feedback. It is not always the case that you can just hand an object to someone on the street and get real feedback. Test in the context that your solution would actually be used (or approximate the important parts of that context). For example, if you are creating a consumer food storage system, let users test it in their kitchens at home - some of the nuanced but important issues will only emerge there.

Some tips for prototyping to test:

Start building. Even if you aren't sure what you're doing, the act of picking up some materials (paper, tape, and found objects are a good way to start!) will be enough to get you going.

Don't spend too long on one prototype. Move on before you find yourself getting too emotionally attached to any one prototype.

Build with the user in mind. What do you hope to test with the user? What sorts of behavior do you expect? Answering these questions will help focus your prototyping and help you receive meaningful feedback in the testing phase.

ID a variable. Identify what's being tested with each prototype. A prototype should answer a particular question when tested.

Testing with Users



WHY test with users

Testing with users is a fundamental part of a human-centered design approach. You test with users to refine your solution and also to refine your understanding of the people for whom you are designing. When you test prototypes you should consider both their feedback on your solution and use the opportunity to gain more empathy. You are back in a learning and empathy mode when you engage users with a prototype.

HOW to test with users

There are multiple aspects to be aware of when you test with users. One is your **prototype**, two is the **context and scenario** in which you are testing, three is **how you interact** with the user during testing and four is **how you observe and capture** and consider the feedback.

In regard to the first two aspects, you need to test a prototype in a context that give you the best chance for meaningful feedback; think about how the prototype and the testing scenario interact. If the prototype is a scenario, think about how to find the proper people (i.e. users relevant to your point-of-view) and get them in the right mindset so that you get genuine feedback.

Roles

During the testing itself, use intentional team roles, as you would with empathy work:

Host: You help transition the user from reality to your prototype situation and give them the basic context they need to understand the scenario (don't over-explain it, let the user discover through the experience). As the host, you will also likely be the lead questioner when the time comes.

Players: You often need to play certain roles in the scenario to create the prototype experience.

Observers: It is very important to have team members who are solely observers, watching the user experience the prototype. If you don't have enough people to run the prototype and observe, videotape the testing.

Procedure

Use a deliberate procedure when you test.

1. **Let your user experience the prototype.** Show don't tell. Put your prototype in the user's hands (or your user in the prototype) and give just the minimum context so they understand what to do. Don't explain your thinking or reasoning for your prototype.
2. **Have them talk through their experience.** For example, when appropriate, as the host, ask "Tell me what you are thinking as you are doing this."
3. **Actively observe.** Watch how they use (and misuse!) what you have given them. Don't immediately "correct" what your user tester is doing.
4. **Follow up with questions.** This is important; often this is the most valuable part of testing. "Show me why this would [not] work for you." "Can you tell me more about how this made you feel?" "Why?" Answer questions with questions (i.e. "well, what do you think that button does").

METHOD

Prototype to Decide



WHY prototype to decide

Often during the design process, it's unclear how to proceed forward, particularly when a team reaches a fork in its decision tree. A prototype can frequently resolve team disagreements and help a team decide which design direction to pursue without having to compromise. The best way to resolve team conflicts about design elements is to prototype and evaluate them with users. Making and evaluating a prototype can be the best way to inform design decisions. If an idea has been prototyped and passes muster with the group, it's a good sign that the idea is worth pursuing further.

HOW to prototype to decide

Staying as low-resolution as possible, develop models of potential design candidates. Be sure to distill the design problem down to discrete elements so you can isolate and be mindful of the variable you are testing. Then try out the prototypes within your team, outsider peers, or, even better, take your prototypes to users and get their feedback.

METHOD

Feedback Capture Grid



WHY use a feedback capture grid

Use a feedback capture grid to facilitate real-time capture, or post-mortem unpacking, of feedback on presentations and prototypes - times when presenter-critiquer interaction is anticipated. This can be used either to give feedback on progress within the design team or to capture a user's feedback about a prototype. You use the grid because it helps you be systematic about feedback, and more intentional about capturing thoughts in the four different areas.

HOW to use a feedback capture grid

1. Section off a blank page or whiteboard into quadrants.
2. Draw a plus in the upper left quadrant, a delta in the upper right quadrant, a question mark in the lower left quadrant, and a light bulb in the lower right quadrant.

It's pretty simple, really. Fill the four quadrants with your or a user's feedback. Things one likes or finds notable, place in the upper left; constructive criticism goes in the upper right; questions that the experience raised go in the lower left; ideas that the experience or presentation spurred go in the lower right. If you are giving feedback yourself, strive to give input in each quadrant (especially the upper two: both "likes" and "wishes").

Phase

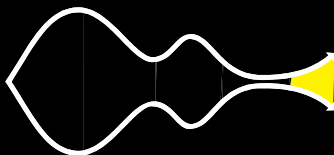
5

Refinement



Photo Credit ToGa Wanderings

WHERE YOU ARE IN THE PROCESS



WHAT'S IN THIS PHASE

- 5-1 *Track Learnings*
- 5-2 *Move Forward*



Phase 5: Refinement

Refinement means testing your solutions and evolving your product. Refinement is the development of your concept and involves communicating the idea to people who can help you realize it, and documenting the process. It also gives you the opportunity to identify indicators of success.

5-1 Track Learning

In order to know if you have a solution that answers the challenge, you need to know the criteria that define success. Identify the indicators for a successful project. You might want to make two sets of criteria, one for the process and one for the product. Rubrics are great tools by which teachers and students alike can identify the success indicators.

Teams should track the process of the design thinking challenge. Teams could document the research completed as well the research skills acquired. They can track the collaboration of the team and the stories that they shared. Writing a reflection of the process is another great way to have students track the process. They can document the initial impressions compared to the end result and how that process transpired. They could also document their achievement and how those occurred. These reflections of the process will enable students to learn from the experience and duplicate it at a higher level the next time.

5-2 Move Forward

In order to reach the full potential of new, innovative solutions, the solutions must be shared with audiences outside the classroom. Depending on the outcomes that you hoped to achieve with your solutions, you might have to pitch your solutions to a specific audience. If you were hoping to bring your solution to the real world, this becomes essential. Here are some essential tips to do just that.

- Know your audience. Whether you are hoping for a grade or moving your project to real use, knowing your audience can make a big difference on how you pitch/present your project.
- Highlight what excites you about your project. This will help you feel less intimidated when presenting your idea.
- Build a narrative. Tell the story of how and why the project took life. Share the experience with the audience.
- Communicate the value of your project. Draw from your Interpretation phase.

At this point you will let the audience experience your project solutions and get feedback from the users. This will be the path to the next best iteration of your solution/project. This process can continue if you want to refine your solution to its best iteration.



Design Thinking Resources

Design Thinking: Correlation to Common Core and NETS-S

Design thinking lends itself well to the Common Core standards and the National Educational Technology Standards for Students (NETS-S). It provides opportunity to practice these standards in a real way. This year, the district is focusing on five CC standards and 3 NETS-S standards. These standards and their correlation to the design thinking process are shown below.

Five Phases of Design Thinking:

Phase 1: Discovery

This initial phase of design thinking presents a challenge or problem for the student to understand. Through prior knowledge, research, interviews, observation and collaboration, students gain knowledge of the challenge or problem.

Common Core

- *RS 1 - Read closely to determine what text says explicitly.*
- *RS 10 – Read and understand complex informational text independently and proficiently.*
- *SL 1 – Prepare for and participate in a range of conversations with diverse partners.*
- *AV 6 - Acquire and use a range of general academic and domain specific words and phrases sufficient for reading, writing and listening. Demonstrate independence in gathering knowledge when encountering unknown terms important to comprehension.*

NETS-S

- *Nets 4 – Identify and define authentic problems and significant questions for investigation, plan and manage activities to develop a solution or complete a project, collect and analyze data to identify solutions and/or make informed decisions.*
- *Nets 2 – Contribute to project teams to produce original works or solve problems.*

Phase 2: Interpretation

This phase of design thinking provides the path to understanding the challenge and making sense of the information gathered. This phase aims to provide students with a clear path to follow based on their interpretation of the information found in the discovery phase.

Common Core

- *RS 1 - Read closely to determine what text says explicitly and to make logical inferences; sites specific textual evidence when writing or speaking to support conclusions drawn from text.*
- *WS 1 – Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant/sufficient evidence.*
- *SL 1 – Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on other's ideas and expressing their own clearly and persuasively.*

NETS-S

- *Nets 1 - Identify trends and forecast possibilities.*
- *Nets 2 - Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media, communicate information and ideas effectively.*
- *Nets 4 - Identify and define authentic problems and significant questions for investigation, plan and manage activities to develop a solution or complete a project, collect and analyze data to identify solutions and/or make informed decisions.*

Phase 3: Ideation

This phase give the students the opportunity to challenge themselves to find innovative ideas to solve the challenge. It is a collaborative effort to generate ideas and go through a process of choosing the ideas that best suit their efforts.

Common Core

- *WS 1 – write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant/sufficient evidence.*
- *SL 1 – prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on other's ideas and expressing their own clearly and persuasively.*

NETS-S

- *Nets 1 – Apply existing knowledge to generate new ideas products and processes, create original works as a means of personal or group expression.*
- *Nets 2 – Communicate information and ideas effectively to multiple audiences, using a variety of media and formats, contribute to teams to produce original works or solve problems.*
- *Nets 4 – Plan and manage activities to develop a solution or complete a project, use multiple processes and diverse perspectives to explore alternative solutions.*

Phase 4: Prototyping

This phase has the students building their ideas. These prototypes can be a physical model, a storyboard, a sketch, a presentation, role-playing or whatever the teams deem appropriate to share their ideas to others. The goal of the prototype is to fail early to produce the best innovative solution.

Common Core

- *WS 1 – write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant/sufficient evidence.*
- *SL 1 – prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on other's ideas and expressing their own clearly and persuasively.*

NETS-S

- *Nets 1 - Apply existing knowledge to generate new ideas, products, or processes, create original works as a means of personal or group expression, Use models and simulations to explore complex systems and issues, Identify trends and forecast possibilities.*
- *Nets 2 - Interact, collaborate and publish with peers experts, or others employing a variety of digital environments and formats, communicate information and ideas effectively to multiple audiences, using a variety of media and formats, contribute to teams to produce original works or solve problems.*
- *Nets 4 - Plan and manage activities to develop a solution or complete a project, use multiple processes and diverse perspectives to explore alternative solutions.*

Phase 5: Refinement

Now that the students have gone through the process of prototyping and incorporating all the feedback that they received, they are ready to take their innovative ideas to the greater public. This could be another class, the teachers or the community. From that experience and feedback they make their final changes. At this point their product/solution can be graded.

Common Core

- *WS 1 – write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant/sufficient evidence.*
- *AV 6 - Acquire and use a range of general academic and domain specific words and phrases*

sufficient for reading, writing and listening.

NETS-S

- *Nets 1 - Interact, collaborate and publish with peers experts, or others employing a variety of digital environments and formats, communicate information and ideas effectively to multiple audiences, using a variety of media and formats*
- *Nets 2 - Communicate information and ideas effectively to multiple audiences,*
- *Nets 4 – Collect and analyze data to identify solutions and/or make informed decisions.*

Assessment

Assessing the design thinking process can take many forms. You can use rubrics to assess the final product, the entire process or pieces of the process. It is up to you.

WHAT'S IN THIS PHASE

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